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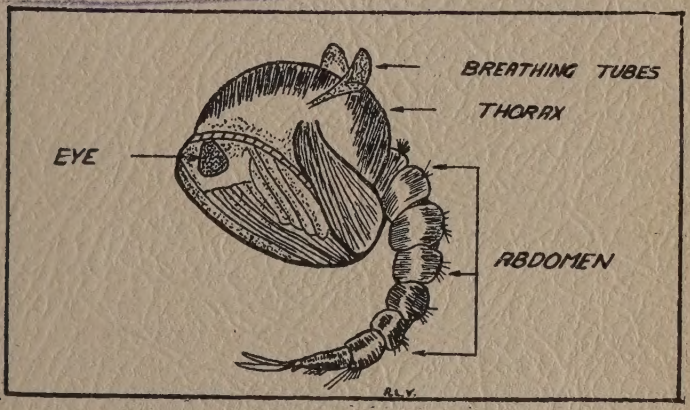

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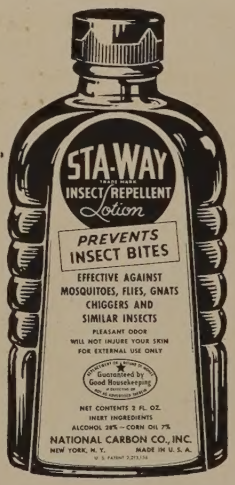

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EDITORIAL COMMENT

Mosquito News wishes to take this opportunity to announce that the war has claimed one of the most esteemed and enthusiastic mosquito control experts in this section of the country.

This refers to Major L. A. Stearns of the Sanitary Corp U. S. A. who is the President of the Eastern Association of Mosquito Control Workers.

Major Stearns also was State Entomologist of Delaware and Director of research and control work on Mosquitoes in that State.

This publication wishes the Major the best of luck in carrying out the duties of his new position and we are sure all his old associates in the Eastern Association will miss him and will follow his future progress with great pride.

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EASTERN ASSOCIATION OF MOSQUITO CONTROL WORKERS

A discussion meeting was held in Pennsylvania Hotel, New York on May 5th, 1942 at which the following papers were presented before the members and guests:

Random observations and hypotheses concerning the relations of fish and mosquitoes

By Mr. John T. Nichols, Curator of Recent Fishes, American Museum of Natural History, New York City

My summer residence for the past 32 years has been at Mastic on the south shore of Long Island, a mostly wooded area facing the broad waters of Moriches Bay to the east, and narrower waters between mainland and outer beach to the south, bordered all around by salt marsh. Several short creeks which used to be quite fresh water flow to the bay.

This has been a mosquitoey locality. Mosquitoes are always common, in most years sufficiently abundant to annoy persons not acclimated to them, not infrequently have occurred in such dense swarms as to be a positive pest. My knowledge of mosquitoes is just sufficient to differentiate the handsomely colored salt marsh variety, from another more uniformly brownish species, which together make up the bulk of the population. There has never been reason to suspect that any malaria mosquitoes were present.

Mosquito swarms usually occur in muggy periods after rains. Aside from any increase directly traceable to the weather their number has varied up and down from unknown natural causes and there have been comparatively mosquitoless unexplained years. Hence correlations which one attempts to draw with this or that factor can only be tentative. I have occasionally

seen mosquitoes on the marshes early in the season carrying a red mite, and have noticed that in such cases there were relatively few mosquitoes later in the season. This again may be coincidence.

Mosquito wrigglers are sought as live food by many or most small fishes. The efficiency of a fish as a mosquito destroyer usually depends on its being small enough and abundant enough, and the young of some species are pretty efficient though the adults are too large. A number of years ago I was on a Florida "river" which seemed as though it should have been mosquitoey, but was quite without mosquitoes. A reason was not far to seek, its borders were literally alive with viviparous tooth-carps, especially Gambusia well known as a destroyer of wrigglers. I furthermore believe that the abundance of these little fish was correlated with an abundance of large-mouth bass out in the channel. The bass no doubt preyed on them, but held down any smaller fish which might have followed them into shallow water and reduced their numbers, as the bass did not.

This situation came to mind later in thinking of a similarly small fish, namely Lucania, which occurred in small numbers in the freshwater creeks at my Long Island locality, where there were also somewhat larger predaceous fishes, notably the brook pickerel which was common, and very likely held down the numbers of smaller species. As an experiment I introduced large-mouth bass in these waters. It followed that the pickerel decreased, Lucania and perhaps other small fishes increased considerable, and there were several years relatively free from mosquitoes. How much this proves and how much it was due to coincidence I don't know, but believe both were factors. Likely in part from lack of proper spawning grounds my bass faded out. For the past 10 years with Moriches inlet open to the ocean, bay and creeks have become progressively more saline, and the old fresh-water balance

is wiped out anyway.

It is generally recognized that fish are an efficient mosquito control, but not how important the balance of fish life may be in such matters. In Florida and on Long Island as indicated, large-mouth bass were an anti-mosquito factor. But I have recently been told that successful introduction of large-mouth bass in Cuban lakes has seriously increased mosquitoes, the bass in this case presumably destroying the mosquito-destroyers instead of their enemies.

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There is one factor in our periodic great abundance of mosquitoes which it seems could not be controlled locally. Mosquitoes doubtless drifted into our woods on the prevailing Southwest wind from the long stretch of marshes which border the south bays of Long Island west of us, and accumulated in the undergrowth. When mosquitoes had been very troublesome, strong winds from the north or the east relieved us of them. In the last year or two they have been considerably less than average, and there is no doubt in my mind that extensive ditching all along the south shore is a considerable factor in their decrease.

As I see it the immediate effect of this ditching is to give small fishes (mostly Fundulus), access to otherwise isolated pools in the marsh, immediately cutting down the number of wrigglers. A second effect which is gradual with the passage of years is to dry out and change the character of the marsh. After 2 or 3 years of ditching our own marsh is becoming relatively dry and firm, even though it is completely flooded by occasional storm tides. This second effect may or may not be desirable from the point of view of mosquito-control, it is very undesirable from that of any other wild life.

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One other observation may have a bearing on the general problem. For 5 years or so we have had a small, shallow, artificial fresh-water pond, which was made at the edge of the marsh by damming a swamp. This is frequented by wild ducks. Sometimes for 2 or 3 weeks in late summer most of it is mud with water only in the deeper parts, and in somewhat isolated pools. Least terns and other birds at such times take out a large part of the grown fish population, concentrated within their reach. Offhand it might now seem to be a danger spot. However, at this time I have found fish fry, a very great abundance of more or less predaceous water bugs, and no wrigglers in any of its water. May we deduce as a general rule that it is not temporarily isolated pools (which will contain a concentration of corrective animals that make a condition favorable for mosquitoes? If this is the case should not the objective be to ditch a marsh so that as its water rises all parts of it will be accessible to the residual fish-life of its deeper parts, rather than so as to drain off its waters?

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These observations are too cursory and too little critical to prove one or another hypothesis. They may serve to emphasize the conviction that successful control of mosquitoes, or any other animal, should rest on an understanding of the existing balance of life, and where possible, work with not against it.

Observations on Some Relations of Mosquito Control Ditching - To Marsh Birds

By Mr. Aretas A. Saunders,
Fairfield, Connecticut

The various different problems that come under the term conservation are not as successful as they might be.

Each different kind of conservationist goes enthusiastically to work, either not realizing or disregarding the fact that what he does or wants to do is detrimental to another kind of conservation. Conservationists need to get together, iron out their differences and take a wide view of the whole problem. Thus, I being interested in all kinds of wild-life conservation, and knowing that that is best brought about by saving natural areas in an unchanged condition, would like best to see salt marshes left just as nature first made them. But I must understand that you, who are working on mosquito control, are therefore engaged in the very important conservation of human health, and I must temper my desires accordingly.

But physical health is not the only basis of human happiness. A large and rapidly increasing number of people in this country are finding their happiness and interest in life greatly increased because there are wild birds to know and enjoy. It would be sad if, in future days, when even more people have found this interest in life, we no longer had Clapper Rails or Seaside Sparrows for them to know, because the salt marshes were all destroyed in the cause of mosquito control. So we, who have a special interest in the bird life of salt marshes, simply ask that you, who are working on the problem of mosquito control, find ways to accomplish your purpose that will keep the salt marsh as nearly natural as possible.

There are a good many species of birds that may be found at different times in salt marshes. Most of these, however, are species that may be found in other places as well; water birds that occur about fresh water as well as salt; shore birds that feed both in the marsh and on mud flats along the beach; predatory birds that prey upon meadow mice that are often particularly abundant in salt marshes, and birds of grassy areas that are equally at home in salt meadows or

grass lands inland. These species are not entirely dependent on salt marsh. But the species that are found only in salt marshes, and both breed and feed there are the ones most important to consider. Destruction of the salt marsh or any great change in it will cause them to leave it and disappear from that vicinity. What actually happens to the particular birds that breed in such an area, when that area is destroyed, we do not know. We merely know that they do not breed in any other areas, and that there is a limit to the number that can breed in a given area of salt marsh, so that the total number in existence is determined by the total area of salt marsh.

The species of birds that I am familiar with in Connecticut that breed only in salt marshes are Clapper Rail, (Rallus longirostris), Seaside Sparrow (Ammospiza maritima) and Sharp-tailed Sparrow (A. caudacuta). These birds are strictly dependent on salt marshes and evidently cannot live elsewhere. There seems to be no reason, from the physical standpoint, why a Clapper Rail should not be able to live and nest in a fresh water marsh, as its relative, the King Rail, does. In the same way the Seaside and Sharp-tailed Sparrows would seem perfectly able to live and nest in any grassy meadow. But instinct is a strong factor in wild creatures and the instinct to seek a salt marsh in which to live and breed, and a salt marsh only, is strong in all these birds. Salt marshes in Connecticut have been steadily decreasing in area. Many of them have been filled in and developed for shore real estate. Others have been turned into parking places at shore resorts. When these areas are so changed, the salt marsh birds do not adapt themselves to life in some other kind of area, nor permanently increase in the salt marsh areas that are left. They decrease in numbers, and it is logical to assume that if or when salt marshes are entirely gone, they will become extinct.

I believe that the chief object of mosquito control

work in ordinary salt marshes, is the abolishment of pools of stagnant water and the maintenance of ditches in which water flows and ebbs with the tides. It is my opinion that such ditching in the marshes does not have a detrimental effect on the three species of birds I have been discussing. So long as that is all that is done to the marsh, these birds remain in normal abundance. In recent years it would seem that the Clapper Rail has increased at least in Connecticut. So far as I know, pools of stagnant water are not necessary factors to any form of bird life.

A good many shore birds feed in salt marshes during their migrations to and from their northern breeding grounds. Some of these birds; particularly the Yellowlegs (Totanus melanoleucus and T. flavipes) feed commonly in shallow water and are attracted by pools. I believe it has been suggested that mosquito ditching has eliminated many of these pools and thus been detrimental. I have not myself noted any decrease in Yellowlegs in the marshes; in fact, they seem to be increasing a little each year. But they are not confined to salt marsh as feeding places, but are common along the beach at low tide, and often about the mouths of streams. They also occur inland in suitable fresh water areas. Another group of shore birds, the Ruddy Turnstone, Black bellied Plover, Knot and Dowitcher often feed together in salt marshes, making a picturesque group of exceedingly attractive birds. They do not feed, in my experience, to any great extent about pools, but here and there over the surface of the marsh, seeming to find abundant food in and about the salt marsh grasses. I do not know definitely, but I believe the food they get is largely a small salt marsh snail of the genus Melampus that is exceedingly abundant in the marshes. This snail is often so common that there seem to be one or more for every square inch of marsh. I know from stomach examination that Black Ducks (Anas rubripes) eat it, and I have also found it in the

stomachs of Starlings (Sturnus vulgaris) shot in a salt marsh, and I believe that many of the salt marsh birds depend largely on it for food. When fire burns over a salt marsh, these snails are destroyed in great quantities, and the area becomes practically birdless for some time thereafter. We had a case some years ago in Fairfield, Connecticut, where men engaged in mosquito work burned the salt marshes because they claimed that the dead grasses of the former year got into the ditches and stopped the flow of water. However, I am informed that this is not the practice of mosquito control workers today, and I sincerely hope that it will never be found to be necessary.

Ditches in the salt marsh are often helpful to a bird observer. Clapper Rails are difficult birds to observe, because they keep hidden in the taller grasses of wetter parts of the marsh and rarely fly. I have found, however, that they often run along the bottom of a mosquito ditch. By looking up and down the long straight ditch with binoculars, I often find and observe them. I remember one case where a bird was in a ditch that ran toward the beach and finally terminated back of the sand dunes. I followed the bird by walking slowly along the side of the ditch, getting nearer and nearer to it. When it came to the end, it emerged into plain sight, and, as I still approached it, finally had to fly across the marsh and drop into another ditch, the first time I had seen this species in flight.

Similarly the Sharp-tailed Sparrow keeps out of sight in the grass, and though it flies more readily than a rail, its beautiful markings of gray, olive, orange-buff and black are difficult to observe. I generally get my best views of this bird on the edges of a mosquito ditch. The Seaside Sparrow may also be seen well here, but it is always more easily seen than the Sharp-tailed, for it likes to mount up into a marsh elder bush (Iva) to sing. It sings much more commonly

than the Sharp-tailed Sparrow, and I believe that the increase of marsh elder bushes, due to mosquito ditching, makes a more favorable environment for this bird.

In the past few years I have observed the effect of a different kind of ditching for mosquito control. In this case the marsh, though not far back of the beach, was several feet higher in elevation than the high tide level. It had been ditched in the ordinary manner for a good many years, but this was apparently unsatisfactory, so, through the W.P.A. a much wider and deeper main ditch was dug, down to the level of the tide, and the water led by conduit under the road and beach to the sound. The result, so far as wild life was concerned, was a complete change in both plant and animal life. The original salt marsh grasses and plants, such as Spartina patens, Distichlis spicata, Juncus gerardi, and others, disappeared and the chief vegetation that took their place was a heavy growth of Switchgrass (Panicum virgatum). The salt marsh birds disappeared, and at present the only breeding bird appears to be the Meadowlark (Sturnella magna). Other birds occur in migration and in winter, and in the past two years there has been, in August, in fall migration, a large number of short billed Marsh Wrens (Cistotherus stellaris). In fact in 1941 I saw in the switchgrass more birds of this species than I had seem before in forty years of bird observations.

It is possible that birds can be helpful in the control of mosquitoes. Most of the birds that eat flying insects are known to include mosquitoes in their diet. Of these the swallows might be attracted to the vicinity of salt marshes. Swallows are fond of flying over open meadows in pursuit of insects. Where there are available nestling sites, they will remain through the summer, and since they nest more or less in colonies and are not territorial in feeding habits, their numbers could be increased. I believe that erection

of structures on salt marshes that would fill the place that barns now do, would attract the Barn Swallow (Hirundo erythrogaster) in sufficient quantities to make a difference in the numbers of mosquitoes. The Purple Martin (Progne subis) is a beautiful bird, with a melodious voice and an appetite for mosquitoes. Before the introduction of the English Sparrow it was common in the northern states. When the Sparrow arrived in this country, it became rare. It became still rarer with the advent of the Starling. It seems to me that martin boxes erected in the middle of a salt marsh would be unlikely to be troubled by sparrows. By such a means we might help in mosquito control, and also aid in increasing a beautiful and valuable bird.

Mr. H. H. Stage, Bureau of Entomology and Plant Quarantine, U. S. Department of Agriculture, Washington, D. C.

presented a talk on the subject "The Relationship of Mosquito Control to the War Effort".

U. S. ARMY

Mr. Stage reported that mosquito control work had begun by the Army in the fall of 1940, after Colonel Hardenbergh and several of his associates had made an extended preliminary survey of the mosquito control needs at 151 stations and reservations in the Fourth and Eighth Corps Areas. The work strongly emphasized the control of malaria carrying species of mosquitoes. It was generally organized on the basis of spraying units consisting of 3 men with a supervisor, and brushing and ditching crews composed of 15 men and a supervisor. The effectiveness of the work is illustrated by comparing statistics of 1917 when the malaria case rate in the army was 7.5 per 1000 with 1941 when the rate was 1.8 per 1000. The spraying was begun in April,

and it is felt that this early start helped greatly in attaining the gratifying results indicated above, by destroying the first broods of anopheline mosquitoes. In all, over 530,000 gals. of oil were used, as well as 470,000 gals. of pyrethrum and phenol larvicides and 52,000 pounds of Paris green. There seemed to be little difference in the results obtained with the various larvicides. The malaria rate was held very low up until the extended field maneuvers of October, after which a peak occurred. Total costs of all work done amounted to about $1,500,000.

It is believed that an increase in the number of trained entomologists and sanitary engineers available for service in the Army reservations would be highly desirable.

Mr. Stage also quoted Colonel Hardenburgh as saying that the combination of an entomologist and a sanitary engineer at each station was in large measure responsible for what the Army considered a successful reason of malaria reduction.

Probably the most satisfactory way to protect the soldiers when on duty in tropic countries would be to attack the mosquitoes in the adult stage by spraying buildings and barracks with such materials as aerosols by attacking the larvae with spray materials, by protecting the soldiers from mosquito bites as far as possible, and by the use of quinine or other drugs.

U. S. NAVY

The Navy is not doing as much mosquito control work as the Army. There has not, however, been a large amount of malaria in the Navy in recent years. In 1917 there were 8.33 cases per 1000, in 1918 - 5.36, in 1919 - 8.64, in 1920 - 23.11. In 1938 there was a rate of 1.21, in 1939 - 0.85 and in 1940 - 1.19. At one large base in the southeast the 1941 rate was 0.6. At the

same time, the civilian rate outside the base was 5 times as great. At that station a mosquito control crew averaging 20 men was kept at work and installed mosquito control drainage on 780 acres of marsh, including 41,000 linear ft. of dragline ditching, and 77,000 ft. of hand ditching.

At another large base, 30 men drained 151 acres of swamp by installing 22,000 linear ft. of hand ditching and 21,000 linear ft. of dynamite ditching.

United States Public Health Service

The United States Public Health Service is responsible for malaria control in the areas immediately outside the reservations of the armed forces, and over a year ago the Service received a considerable fund with which to do extra-cantonment work, including work against mosquitoes and the dog fly. This agency has a number of entomologists and sanitary engineers working and a large program of malaria mosquito control is under way in the southern states.

The Service also has the responsibility of preventing the entrance of mosquitoes by aeroplane, at the various points of entry. The aerosol spray cylinder, with which an aeroplane can be treated with 30 seconds of spraying, has been demonstrated to them, and will probably replace the more bulky spraying apparatus that has been used previously in spraying aeroplanes.

Bureau of Entomology and Plant Quarantine

The Bureau has streamlined its research program as much as possible, and no new research will be begun for the present except as it is directly concerned with the war. Mr. W. G. Bruce of the Department has been appointed as a Liaison Officer to maintain close relations with the Army and Navy on common insect problems.

He has been visiting camps and giving all possible help and information on insect problems. Work is under way on a general repellent, for mosquitoes, chiggers, sand flies and dog flies. This work is being supported with funds received for that purpose from the National Emergency Council, and is proceeding in utmost secrecy. Dr. Headlee's office has cooperated freely, and it is regretted that information cannot be given out, in return for the help received.

Mr. W. G. Bradley has been loaned to the United States Public Health Service to coordinate malaria mosquito inspections and control in the several southeastern states.

Recently the Bureau has been called into consultation with reference to two large war projects, a large shipyard that is being built in the middle of a salt marsh area, and the Alaskan Highway, which will pass through great mosquito breeding areas.

PLANS FOR AN INVESTIGATION TO DETERMINE THE MEANING OF CATCHES OF ANOPHELES QUADRIMACULATUS IN ELECTRIC LIGHT TRAPS

Thomas J. Headlee, Entomologist,
New Jersey Agricultural
Experiment Station,
New Brunswick.

Introduction

The reason for undertaking these proposed studies lies in the fact that while the electric light traps catch a greater or less number of Anopheles quadrimaculatus, they are thought not to catch a sufficiently representative sample to be significant. This indictment of the performance of the electric light trap

comes primarily from the sub-tropics and the tropics, although recently similar data has been collected by Dr. Stearns' organization in Delaware in the neighborhood of Fort DuPont.

In view of the fact that the electric light trap does sample the bulk of the mosquito fauna of the point in which it works in a rather satisfactory manner, and in view of the further fact that it does catch greater or less numbers of Anopheles quadrimaculatus, it is thought worthwhile to see whether we can learn to read the significance of the Anopheles quadrimaculatus catch in terms of the density of Anopheles quadrimaculatus on the wing. In the northeastern states and in the northern section of the Middle Atlantic States, Anopheles quadrimaculatus breeding is sporadic and the overwintering reduction of the adults is very large. The prevalence of malaria in these states is like wise sporadic and rarely of endemic character. The southern section of the Middle Atlantic States and the Southeastern States, on the other hand, exhibit a fair to well established prevalence of the breeding of Anopheles quadrimaculatus and correspondingly a fair to well established lrevalence of malaria. Furthermore, overwintering losses of adult Anopheles quadrimaculatus are probably greatly reduced.

While it is believed possible in the northeastern states and in the northern section of the Middle Atlantic States to learn to read the meaning of A. quadrimaculatus catches in the electric light traps in terms of the density of A. quadrimaculatus fauna on the wing and the density of the breeding from which that fauna comes, it is not thought possible to determine the relation of that fauna to the prevalence of malaria. The correlation of the density of A. quadrimaculatus fauna to the prevalence of malaria can probably be determined only in areas where that disease is endemic. These plans, therefore, are designed to determine the former correlations and not the latter.

Size and Nature of Area

The first point in these plans is to select a limited sized area over which to make the study. After giving this question a good deal of consideration and discussion, it is suggested that an area of one square mile is sufficiently large to give reliable data and at the same time sufficiently small to be compassed by available time and energy. The center of this square mile should be a fairly large, and more important, a well established breeding place of Anopheles quadrimaculatus. This area of one square mile should be carefully plotted with all water accumulations, streams, roadways, buildings, woodlands, pastures and cultivated fields which it covers. Arrangements should be made to secure weather data covering temperatures, rainfall, evaporation and wind direction and intensity.

Procedure

An electric light trap should be mounted in the standard fashion, should be planted at a distance of about 100 feet from the breeding pool with a clear space between and should be so set as to be protected from high winds. This trap should go in operation every evening about seven o'clock, Eastern War Time, and should continue until seven o'clock the following morning, Eastern War Time. All mosquitoes caught should be collected from the trap daily in the forenoon and identified. The trap should run throughout the season.

At least two nail keg traps should be planted on their sides in a similar location but separated from the light trap and each other by about 100 feet. Both nail keg traps should be examined each forenoon. In one the mosquitoes should be determined and counted but not removed. In the other the mosquitoes should be killed, determined and counted. It is thought that hydrocyanic acid gas should be used for the killing. A large open-mouth glass container charged with calcium cyanide can

be inserted in the nail keg where the mosquitoes are to be killed. Killing will be prompt and the gas will quickly disappear. These nail keg traps should run every day throughout the season.

Buildings and structures suitable for roosting and for feeding should be selected. Collecting places within them should be determined and density of A. Quadrimaculatus in each of these collection places made daily.

Once each week the entire square mile area should be searched for mosquito breeding, especially, but not solely, for A. quadrimaculatus. A standard procedure of dipping for quantitative determination of mosquito breeding with especial reference to A. quadrimaculatus breeding should be devised and adopted. These weekly quantitative summaries of mosquito breeding for the different water accumulations of the square mile area should be carried out throughout the breeding season.

Data Secured

At the close of the season's study for this square mile area we should have a record of all mosquitoes caught in the electric light trap, all mosquitoes taken in the nail keg traps, the density of quadrimaculatus in buildings and structures which had been selected as suitable for roosting and feeding, and the density of mosquito breeding, with especial reference to Anopheles quadrimaculatus.

As the study proceeds, the mind of the thoughtful operator will be intrigued by questions, the answers to which he does not know and unless fully realizing that changes are dangerous and have repercussions in various directions, he might be led to make such changes in procedure as to destroy the possibility of correlation at the end of the season. The operator

must, therefore, be very slow to make changes in his original plan and should make them only after having given them a most thorough examination.

General Comments

It is hoped that there will be at least four such square mile units under study in the State of New Jersey in the season of 1942. It is understood that Dr. L. L. Williams has planned a very extensive study of these questions in the southeastern states and that he will accumulate a very large amount of data. It is understood that Dr. Williams has secured the services of Dr. G. H. Bradley of the Bureau of Entomology and Plant Quarantine for organizing and carrying out this study. It is hoped that at some other points in this country where malaria mosquitoes are prevalent similar studies may be undertaken. Finally, it is hoped that all new information obtained in this study can be brought together in a symposium at the next annual meeting of the New Jersey Mosquito Extermination Association.

From The Minutes of the Eastern Association Meeting
Random Observations and Hypotheses Concerning Relations of Fish and Mosquitoes

By Mr. John T. Nichols,
Curator of Recent Fishes,
American Museum of
Natural History, N. Y.

Mr. Nichols' paper sets forth his observations in Florida, and on Long Island, especially in the area about Moriches Bay, which is near his summer home at Mastic.

An instance of the effectiveness of Gambusia in providing for the control of mosquito breeding in Florida "river" is reported, and it is indicated that the immediate effect of salt marsh ditching on Long Island is to give small fishes, mostly Fundulus, access to isolated pools where they destroy the larvae.

The importance of having present numbers of fish of the proper size is emphasized. An experiment is reported where the numbers of Lucania, a small fish that was present in fresh water creeks on Long Island, was much increased by stocking the stream with large mouth bass, which reduced the number of brook pickerel which had previously been preying on the Lucania. For several years thereafter, the numbers of mosquitoes were reduced.

For the last several years there have been less mosquitoes in the Moriches Bay region, and this is atrributed to the recently installed ditching all along the south shore of Long Island. The author states, "These observations are too cursory and too little critical to prove one or another hypothesis. They may serve to emphasize the conviction that successful con-

trol of mosquitoes, or any other animal, should rest on an understanding of the existing balance of life, and where possible, work with not against it."

Dr. Glasgow emphasized the relationship, so well illustrated by Dr. Nichols' paper, which exists in all kinds of pest control work which depends upon natural enemies.

Mr. VanDerwerker remarked in Union County there are many permanent fresh water pools that are stocked with fish, and that are posted to be sure that they are not sprayed. The permanent ponds and pools which dry down during the summer usually do not cause much difficulty, but where swamp areas are overflowed as the result of rains, and the water surface increases to many times its original area, the natural enemies are insufficient to cope with the resultant mosquito breeding and extensive use must be made of artificial control methods.

A discussion took place concerning the changes which have occurred since the inlet broke through from the Ocean into Moriches Bay.

Mr. Nichols said the center of the bay, and the channels were always quite salt, though there was no true tide, but only a rise and fall depending upon the wind. The marsh bordering the bay, as indicated by the vegetation and the mosquitoes, was distinctly salt, but fresh water fish were found near the edges of the marsh and in the creeks, and fresh water vegetation appeared near the head of the marsh.

Dr. Glasgow remarked that the waters of the bay had become much more saline since the inlet had become established. Previously the marsh had been more affected by rains than by tides, and when flooded was much the same as a fresh water marsh.

Mr. Smith expressed the hope that Dr. Nichols would continue his observations of the fish life in this section, and give us in the future an outline of changes that might take place. He added that distinct changes had been noted on some marshes, for example, where salt marsh elders had become established, birds were now nesting in the elders.

Mr. Stage described a population survey that had been made on a 200 acre marsh at Portland, Oregon with the aid of Boy Scouts. The Survey was intended to determine the relation of mosquito work to ducks and pheasants. There were a number of nests found, and only rarely had one been tramped down by the men. Crows and growing boys were found to have killed many of the young. It was also found that flood waters of the Columbia River had damaged many more birds' nests than could possibly have been damaged by mosquito work.

Dr. Headlee stated that since 1900 the value of fish as a mosquito control agency had been full recognized, the only question had been what kind, and how to best use them. The whole scheme of mosquito control on the open salt marshes is dependent upon opening up the marshes by sufficient ditching so that the salt water minnows can penetrate to all portions of the marsh to consume the larvae as fast as they appear. On the marshes adjacent to great centers of human population, the control exercised by the fish is not sufficiently complete and the tides are fenced out by dikes, any residual water being sprayed to destroy mosquito breeding therein.

Observations on Some Relations of Mosquito Control Ditching to Marsh Birds

By Mr. Aretas A. Saunders,
Fairfield, Connecticut.

Mr. Saunders' paper states that many species of

birds frequent the salt marshes, but most of them may be found elsewhere as well. The species of birds in Connecticut which are strictly dependent upon salt marshes and which evidently cannot live elsewhere are specified as the Clapper Rail, Rallus longirostris, Seaside Sparrow, Ammospiza maritima, and the Sharp-tailed Sparrow, A. caudacuta. Destruction of the salt marsh or any great change in it will cause them to leave it and disappear from that vicinity. Examples of such changes are the filling in and developing of salt marshes for shore real estate, and the converting of marshes into parking places at shore resorts. It is indicated that the ordinary ditching of salt marshes to provide an ebb and flow of the tide in the ditches and the abolishment of pools of stagnant water has no detrimental effect on these species of birds.

A very important food of various birds is a salt marsh snail of the genus Melampus. The importance of avoiding the burning off of salt marsh grasses and consequent destruction of large numbers of these snails is stressed.

The salt marsh ditches are reported to be helpful to a bird observer, for several species of birds are apt to be found along or in the ditches, for example, the three species previously mentioned.

An example of a complete change in both plant and animal life on a salt marsh is described. In this instance, a high salt marsh was drained by a very wide and deep ditch and the change occurred in a few years.

Ce Certain birds are indicated as probably helpful in the control of mosquitoes. The Barn Swallow, Hirunde erythrogaster, and the Purple Marten, Progne subis, are named as among these. If structures were placed on the salt marshes to attract these birds, it is likely that mosquito control, and the increasing of beautiful and valuable birds would be aided.

Mr. Saunders indicated that where salt marshes were partly filled by hydraulic means, the salt marsh grass generally disappeared to be replaced by Phragmites. In this latter growth, long billed marsh wrens and red winged black birds would nest. He also said that much damage was done to nesting birds when marshes were burned, and that burning also destroyed the snails on which birds feed.

Dr. Headlee said that in New Jersey the farmers formerly burned off all of their marshes to improve the hay. He inquired if there was any time of the year when burning could be practiced without damage to the snails and added that he had found snails at the surface of the marsh when it was wet, and half inch to several inches below the surface when the marsh was drier. He also added that there seemed to be a greater number of biting houseflies. Stomoxys calcitrans, which species is known to breed in decaying seaweed on the beaches, since the farmers have generally stopped burning off the meadows.

Mr. Stage said the same fly had been found breeding in windrows of fermenting grasses on the Gulf Coast beaches, in rotting celery waste in Florida, and in rotting peanut litter in Georgia.

Dr. Stearns commented that he had opportunity to observe muskrats on a marsh that was burned each year, and which the Delaware Station has rented for experimental purposes for the past 8 years. This marsh has a muskrat population as high or higher than unburned marshes nearby. The greatest number of houses appears to be in areas of panicum though there are feed areas of Scirpus and of Spartina cynosuroides nearby. This area is burned only because the owner burns the balance of his marsh. This year the rented area was burned on April 3, the owner having burned the rest about 10 days earlier. In general, Delaware marshes are burned just after the musk-

rat trapping season, which ends March 1st on open marshes and March 10th on inclosed marshes.

Mr. Hart called attention to a discussion on marsh burning which appears in the record of the Toronto meeting of the North American Wild Life Conference.

Mr. Smith remarked that it is unwise to burn off marshes where mosquito ditching machines are to be used, for traction is reduced and the chance of the machine becoming mired is increased. However, on the sections where hay is being cut, it is impracticable to prevent the farmers from burning, for they have found they can increase their hay yield by burning.

The Relationship of Mosquito Control to the War Effort

By Mr. H. H. Stage,
Bureau of Entomology and
Plant Quarantine,
U. S. Dept. of Agriculture,
Washington, D. C.

Mr. Stage reported on the work being done by the U. S. Army, the U. S. Navy, the U. S. Public Health Service, and the U. S. Department of Agriculture.

In the Army an extensive program of malaria control is having the desired effect, as illustrated by the comparison of figures on malaria case rates, in 1918 the rate was 7.5 per 1000, and in 1941 it was 1.8. Total costs of the work in 1941 amounted to about $1,500,000.

In the Navy, although the amount of work done was much less, a similar favorable comparison of malaria rates exists. One instance is reported where the civilian rate outside a large southern base is five times as great as the rate within the base.

The Public Health Service has underway a very large program of malaria control in the southern states, this program being directed at the control of malaria immediately outside the reservations of the armed forces.

The Bureau of Entomology and Plant Quarantine has streamlined its research program, and is giving all possible aid to the Army and Navy in solving insect problems. Work is under way on a general insect repellent for use against mosquitoes, chiggers, dog fleas, sand flies, etc., and the Bureau has been called into consultation regarding the construction of a large ship-yard in the middle of a salt marsh area, and the construction of the Alaskan Highway. Mr. Bradley has been loaned to the U. S. Public Health Service to coordinate malaria mosquito inspection and control.

Lt. Darvin E. Hoppert said that provision was made for anti mosquito work in Army reservations. The Chief Engineer has allotted funds to the District Engineers, to be made available to Post Utilities Officers when the Post Surgeons apply for funds with which to institute mosquito control works. He added that the men with mosquito control experience who are officers in the Sanitary Corps were required to perform other duties besides the direction of mosquito control work.

Plans for An Investigation to Determine the Meaning of Catches of Anopheles quadrimaculatus in Electric Light Traps

By Dr. Thomas J. Headlee,
State Entomologist,
New Jersey Agricultural
Experiment Station,
New Brunswick, N. J.

Dr. Headlee outlined a plan for the comparing of catches of malarial mosquitoes in light traps, with the

catches that can be secured by other means. An area of about one square mile should be selected with a known breeding place of malarial mosquitoes near its center. An electric trap, and at least two nail keg traps should be operated. Collections of adults in resting places should be made, and the breeding places should be examined carefully for larvae. All observations should be made at least weekly, and careful records should be kept. Data covering weather conditions should also be secured. If malaria is present in the district, complete figures concerning its abundance and distribution should be had. The coordination of these data should indicate the significance of the Anopheles quadrimaculatus catch in light traps in terms of numbers of this species on the wing. Similar studies should be made elsewhere.

In the discussion following the foregoing paper, it appeared that Dr. Williams of the United States Public Health Service has planned a study of the effectiveness of the N. J. Mosquito Trap as a sampler of Anopheles quadrimaculatus, and that Dr. Stearns of Delaware also plans some work along this line.

Dr. Headlee stated that Mr. Jobbins is using modified light traps to measure An. albimanus, the principal malaria carrier in Panama.

Dr. Stearns indicated the study in Delaware will be made in the vicinity of Fort Dupont, where there are several known, large anopheline producing areas. Mechanical traps and barrel traps will be run at various localities and various distances from the breeding areas. Also, all feeding and resting places will be inspected as well as keeping track of larvae production. The principal difficulty seems to lie in measuring the influence of the feeding and resting places on the trap catches.

Dr. Arturo Luis Berti commented that in using animal baited traps it had been noted that catches would

decline each successive day that the trap was operated in a particular location, but that as soon as it was moved even a few feet, the collections increased again to the original density. The cause of this is so far unknown. Dr. Berti also expressed considerable interest in the small sprayers using aerosol, which were described by Mr. Stage.

Speed Sprayers

Dr. Ginsburg described a new type of power sprayer that is available. It utilizes an air propeller to blow the spray material in a fine mist for long distances. It should be ideal for use in misting with larvicide to protect out-door gatherings of people from mosquitoes.

Mr. Thompson remarked that he had seen the speed type sprayer in action and that it seemed to show promise for such work as Dr. Ginsburg had mentioned, as well as for its usual type of service as an agricultural sprayer. He suggested the application of repellents through steam lines and air hoses, about industrial plants or shipyards where mosquitoes were reducing the workers efficiency, such as the shipyard mentioned by Mr. Stage. He also expressed the need for caution in using any chemical preparation as a routine treatment for materials not now looked upon as toxic when used occasionally, may prove to be objectionable if used frequently and in large quantities.

Mr. Van Derwerker remarked that he had had occasion to apply N. J. Mosquito Larvicide through the air conditioning system of an industrial plant, and had secured good results.

Mosquito News

Mr. Van Derwerker said the next issue of Mosquito News would appear in June. He added that the response

of the membership had been gratifying to the appeal made for contributions, and many articles had come in. Articles had been solicited from workers outside the membership, and the response had been good. A desire to receive the book regularly had been expressed by some workers.

After considerable discussion, Dr. Ginsburg moved that the President appoint a committee to plan additional distribution of Mosquito News, to a selected free list of not over 50 key libraries and institutions, the committee to be authorized to send the most recent issue, and back issues if they are wanted. Dr. Glasgow seconded the motion and it was passed unanimously.

Virginia Inspection

-A letter was read from Mr. Perry W. Ruth, inviting the Association to inspect the mosquito work being done around Norfolk, and setting forth in detail the schedule. The group could leave New York via train at 9:00 P.M., traveling overnight to Cape Charles, where a boat could be boarded early the next morning for a trip across Chesepeake Bay to Norfolk. Mr. Ruth would provide transportation around Norfolk and return the group to the boat in the evening at the close of the inspection. The return trip could then be made overnight. By this scheme, auto transportation would be cut to a minimum, and only one full day would be missed from regular business. It was the concensus of opinion that the trip should be made on June 19.

Brief Biological Notes on Mr. John T. Nichols and Mr. Aretas A. Saunders.

Mr. John Treadwell Nichols was born at Jamaica Plains, Massachusetts in 1884. He received the Bachelor of Arts degree at Harvard in 1905, and has since been on the staff of the American Museum of Natural

History; as Assistant, Department of Ichthyology, 1909-1913; Assistant Curator, 1913-1919, Associate Curator, 1913-1928; and Curator of Recent Fishes, 1928 to date. Mr. Nichols is a member of many scientific societies; the American Association for the Advancement of Science; the American Society of Arnithologists and Herpetologists (of which he was Honorary President in 1937); the American Ornithological Union; the Nuttall Ornithological Club; the Biological Society of Washington; the Linnaean Society of New York; and others. His principal interests are fish and birds. Mr. Nichols has lived for many years on Long Island with a summer home at Mastic, overlooking Moriches Bay. He is an enthusiastic field naturalist, and has an exceptionally thorough knowledge of the animals and plants of Long Island salt marshes, and the adjacent upland.

Mr. Aretas Andrews Saunders was born at Avon, Connecticut, in 1884. He received the degree of Bachelor of Philosophy at the Yale School of Forestry in 1907, after which he served as Forest Assistant, U. S. Forest Service, 1908-1913, in the Montana Rocky Mountain region. Since then he has taught biology; from 1913-1916 in Union High School of West Haven, Connecticut, and from 1916 to date in Central High School of Bridgeport, Connecticut. In summers, Mr. Saunders has worked and taught, in 1914 and 1915 as Ornithologist and Biologist at the Flathead Lake Biological Station, Flathead Lake, Montana; from 1921-1926 as Field Ornithologist, for the Roosevelt Forest Wildlife Experiment Station; and from 1927-19 , as Teacher of Biology and Field Naturalist, at the Alleghany School of Natural History, Alleghany State Park for the New York State Museum. He is a member of the American Ornithological Union, the Cooper Ornithological Club, and the Wilson Ornithological Club. His chief interests are Ornithology, Ecology of birds; Behavior of Wild Birds under natural conditions; and Bird Songs. Mr. Saunders is an all round field naturalist, with

many years of practical field experience. Notable among his publications is his New York State Museum Handbook No. 7, entitled "Bird Song", which enjoys the distinction of having been reprinted in Braille for the blind, under auspices of the Library of Congress. Mr. Saunders has lived for many years close to the North Shore of Long Island Sound, and has an exceptionally intimate knowledge of the plants and animals, and the physical characteristics of Connecticut salt marshes, as well as of upland habitats of Connecticut, of the Montana Rockies, and of New York State.

Report on Eastern Association of Mosquito Workers Inspection Trip to Norfolk, Virginia

By Perry W. Ruth
Bureau Mosquito Control
City of Norfolk

On the morning of Friday, June 19, it was our pleasure to welcome back to Norfolk a group of the Eastern Association of Mosquito Workers who had accepted our invitation to make another inspection trip in this area. They had been accompanied all the way from New York by a strong contingent of our Naval forces, and while this unexpected war time courtesy was greatly appreciated it did cramp their quarters somewhat and reduced their breakfast rations, but we were able to make up the latter deficiency later on.

We had arranged for ample transportation and were soon out of terminal traffic and at the comparative quiet of our field head-quarters where coats were shed, experiences were exchanged and pressure was generally relieved in preparation for a sight-seeing swing around the various points of interest we had chosen as most typical of our problems in this war construction locality. Each man received a descriptive itinerary with a sketch of the area showing the location of our various stops.

Our morning was taken up with the various problems presented in Boush Creek. This is a large salt marsh basin, formerly heavily infested by Aedes sollicitans and A. Taeniorhynchus but later ditched and drained under our direction. Now its outlet is practically closed by hydraulic fill and war construction and the impounded water is rapidly becoming so fresh that Anopheles quadrimaculatus breeding is increasing at an alarming rate. Our cars gave a breathing space between stops but walking was necessary to reach many of the vantage points and this healthful exercise was appreciated by all later on (I hope).

As the noon hour drew up on us, we passed through the Norfolk Azalia Gardens where a short time before dogwood and azalia blooms had painted a beautiful picture but where now a cool breeze and icy well water were fully as welcome. And then on to Norfolk's well known "General Booth Farm" where a majority of the city's minor offenders spend their days out of doors, not only earning their own keep but turning back a profit to the City Government from the various productive activities in which they engage. Here we were welcomed by Dr. Henry G. Parker, Director of Public Welfare, under whose Department both the General Booth Farm and the Bureau of Mosquito Control are included, and for an hour the group relaxed and partook of a bountiful luncheon. By way of diversion, apparently a bomb raid was staged too close for comfort for at intervals the dishes danced on the tables and chairs bounced off the floor. Nearby Government road building across a swamp with dynamite furnished the answer but it kept the thought of war with us. After the last dish of ice cream had gone to its appointed place, Dr. Parker gave us a brief address and then introduced our principal speaker, Rev. P. Rowland Wagner, pastor of the Central Baptist Church and one of the best known after dinner speakers in the state. His talk contained both humor and common sense and at its close, both our digestion

and our disposition were improved.

Following lunch, Dr. Parker took us on a tour of inspection about the farm and his explanations, including a practical demonstration of hog raising, were very interesting to us all.

Our afternoon's itinerary took us to Mason Creek, an area somewhat similar to Boush Creek and disturbed in much the same way but where conditions are more serious due to concentration of population close by. Every group of mosquito workers throughout the country is faced with some extra problem this year and I believe the members of the party realize that we in Norfolk cannot sleep peacefully on a bed of roses this summer if our job of prevention is to be carried through.

As the afternoon lengthened, we headed back toward "The Farm", passing on the way more acres of temporary housing units muchrooming over night for the defense workers and in many cases creating an additional mosquito problem for us to meet. Our arrival precipitated a general raid on the ice water facilities which were strained but held up under the assault and promptly at five o'clock we gathered in the Recreation Hall of the Welfare Center to hear a talk by Mrs. Charles C. Day, President of the Federation of Garden Clubs of Norfolk and vicinity, who gave us a comprehensive story of the movement here and spoke very flatteringly of mosquito work in general and that in Norfolk in particular.

Following Mrs. Day's address, general conversation in the shade of fine old trees carried us to six o'clock when dinner was served in a way not at all resembling the usual idea of "Prison Fare". The business meeting which followed was called to order by Secretary Mulhern who in the absence of both President and Vice President was appointed Chairman and the various points brought up for discussion were ably handled in his usual cheerfully direct way. Of course, any mosquito meeting without

Dr. Headlee is rather like turkey without cranberry sauce - it may be good but it just lacks a certain flavor. I know we were all keenly disappointed that he could not be with us and we rejoice that his disability was only temporary.

The ride back to the city in the dusk was pleasantly cool and a little before eight o'clock the caravan drew up to the Pennsylvania Railroad Terminal where the boat was waiting to start back to Cape Charles and the train for New York.

And so ended a full day for us all but one which I only hope our visitors enjoyed half as much as I did and may be willing to repeat some time in the future.

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ACTIVITIES IN MEMBER STATES

R. E. Dorer,
Asst. State Director,
U. S. Public Health Service,
Norfolk, Virginia.

Sorry that I have not had time to prepare an article for the "Mosquito News". However, I am enclosing several clippings which might be used for the article. Also it might be recorded that in Virginia we have had a record

dry season. Rainfall for July being -4.14 departure from normal. The accumulated departure from normal since January 1 has been -9.92. Accompanying this dry spell, we have had exceptionally hot weather. Average temperature departure for July being +3.3. Average daily departure since January 1 being +2.0.

Around the first of August we had a brood of salt marsh mosquitoes which has been fairly general up and down the coast, I understand.

John Flynn, Superintendent,
Passaic County Mosquito
Extermination Commission,
Patterson, N. J.

In no year since mosquito control work was started in Passaic County have so many Anopheline mosquitoes, both in the larval and adult stage been collected as has been the case this year.

In many of the ditches in the central area of the county where larvae have been observed, the Anopheline species, both Punctipennis and Anopheline have been found to be abundant.

We have after considerable delay been fortunate in securing a new 1 1/2 Ton Dodge Truck and Hardie Super Triplex Straight Frame Sprayer, with a capacity of 10 gallons per minute, 400 pounds pressure, with 250 gallon Steel Tank, which will be mounted on the new truck. With this new equipment we will be able to better prevent annoyance by adult mosquitoes to outdoor gatherings. Although we have been getting remarkably good results with our small hand spraying equipment, in our work at the Hinchliffe Stadium, Paterson.

As to the Pyrethrum Larvicide, we feel as though it is a miracle worker, in so far as giving freedom

from mosquito annoyance to outdoor gatherings. Several people have tried the mixture with wonderful success in their rear yards.

(Example of Press Release
used in Suffolk County)
Suffolk County Mosquito
Extermination Commission,
Yaphank, L. I., N. Y.

Most boat owners will be surprised to hear that they may be breeding mosquitoes, says the Suffolk County Mosquito Extermination Commission. As this is the boating season it seems wise to explain what is meant by this. Gasoline rationing is partly to blame for this situation. Sailors can no longer use their boats at will and consequently large numbers of open boats are on dry land or tied up to moorings for weeks at a time. Idle boats collect rain water and rain water breeds mosquitoes. This is not supposition because breeding has often been found in unused boats.

Small boats on shore are the worst offenders. There are three ways to prevent mosquitoes from breeding in the rain water which collects in such boats. The best thing to do is to turn the boat upside down. If this is impracticable the boat should be completely covered or drained in such a way that no water collects in the bilge.

Open boats in the water will also breed mosquitoes if allowed to remain idle for as little as two weeks. If the boat cannot be covered a good larvicide should be sprayed in the bilge every ten days. Some people believe that mosquitoes do not breed in salt water. As a matter of fact salt water accounts for half the mosquito population in the county.

This boat situation demonstrates only one of the serious conditions under which mosquitoes breed. Another

interesting breeding place was recently uncovered. Due to the collection of scrap rubber, large numbers of old automobile tires are allowed to stand outside of garages. One such pile was recently inspected and it was found that the rain water in these old shoes was actively breeding mosquitoes.

The tin can and cesspool situation has been adequately dealt with in previous articles but householders are urged to watch several other breeders. Uncovered rain barrels and cisterns, for instance, always breed mosquitoes. They should be covered or screened. Ornamental urns should be emptied after every storm. Water in bird baths should be changed every three or four days. Ornamental pools should be emptied or stocked with fish. Inspect roof gutters for stoppages and sags which prevent water from flowing freely.

Owners and tenants are urgently requested to profit by the messages contained in these appeals and help the Mosquito Commission to control this most annoying insect, remembering that the Commission, like most other enterprises, is working under difficulties and will be seriously handicapped for the duration of the war.

Pyrethrum Shortage and the New Jersey Mosquito Larvicide

Joseph M. Ginsburg,
Rutgers University, New Brunswick, N. J.

Since pyrethrum was temporarily placed by the W. P. B. (War Production Board) under complete allocation control by general preference order M-179, anxiety has been aroused among mosquito control workers concerning the possibility of obtaining pyrethrum extract for the New Jersey mosquito larvicide in the future. The order provides that no pyrethrum may be delivered without express authorization of the director

than the Sharp-tailed Sparrow, and I believe that the increase of marsh elder bushes, due to mosquito ditching, makes a more favorable environment for this bird.

In the past few years I have observed the effect of a different kind of ditching for mosquito control. In this case the marsh, though not far back of the beach, was several feet higher in elevation than the high tide level. It had been ditched in the ordinary manner for a good many years, but this was apparently unsatisfactory, so, through the W.P.A. a much wider and deeper main ditch was dug, down to the level of the tide, and the water led by conduit under the road and beach to the sound. The result, so far as wild life was concerned, was a complete change in both plant and animal life. The original salt marsh grasses and plants, such as Spartina patens, Distichlis spicata, Juncus gerardi, and others, disappeared and the chief vegetation that took their place was a heavy growth of Switchgrass (Panicum virgatum). The salt marsh birds disappeared, and at present the only breeding bird appears to be the Meadowlark (Sturnella magna). Other birds occur in migration and in winter, and in the past two years there has been, in August, in fall migration, a large number of short billed Marsh Wrens (Cistotherus stellaris). In fact in 1941 I saw in the switchgrass more birds of this species than I had seem before in forty years of bird observations.

It is possible that birds can be helpful in the control of mosquitoes. Most of the birds that eat flying insects are known to include mosquitoes in their diet. Of these the swallows might be attracted to the vicinity of salt marshes. Swallows are fond of flying over open meadows in pursuit of insects. Where there are available nestling sites, they will remain through the summer, and since they nest more or less in colonies and are not territorial in feeding habits, their numbers could be increased. I believe that erection

of structures on salt marshes that would fill the place that barns now do, would attract the Barn Swallow (Hirundo erythrogaster) in sufficient quantities to make a difference in the numbers of mosquitoes. The Purple Martin (Progne subis) is a beautiful bird, with a melodious voice and an appetite for mosquitoes. Before the introduction of the English Sparrow it was common in the northern states. When the Sparrow arrived in this country, it became rare. It became still rarer with the advent of the Starling. It seems to me that martin boxes erected in the middle of a salt marsh would be unlikely to be troubled by sparrows. By such a means we might help in mosquito control, and also aid in increasing a beautiful and valuable bird.

Mr. H. H. Stage, Bureau of Entomology and Plant Quarantine, U. S. Department of Agriculture, Washington, D. C.
presented a talk on the subject 'The Relationship of Mosquito Control to the War Effort'.

U. S. ARMY

Mr. Stage reported that mosquito control work had begun by the Army in the fall of 1940, after Colonel Hardenbergh and several of his associates had made an extended preliminary survey of the mosquito control needs at 151 stations and reservations in the Fourth and Eighth Corps Areas. The work strongly emphasized the control of malaria carrying species of mosquitoes. It was generally organized on the basis of spraying units consisting of 5 men with a supervisor, and brushing and ditching crews composed of 15 men and a supervisor. The effectiveness of the work is illustrated by comparing statistics of 1917 when the malaria case rate in the army was 7.5 per 1000 with 1941 when the rate was 1.8 per 1000. The spraying was begun in April,

of Industry Operations. The director may also decide the use for which pyrethrum is considered essential in our war effort.

Now, mosquito eradication is of vital importance from the standpoint of both health and disease, expecially in areas of army camps, naval bases, aviation training schools, etc., where soldiers and their visitors from malarial states in the south (many of whom may be carriers of the malarial parasites) may spread malaria among the troops as well as among the civilian population in non-malarial states, wherever A. quadrimaculatus or other Anopheline species of mosquitoes, capable of transmitting malaria breed.

In the general program of temporary mosquito control, the application of pyrethrum larvicide has become definitely established wherever mosquito oil is objectionable, and in protecting outdoor audiences from mosquito annoyance. At present there is no other material available which could completely replace pyrethrum in its combined properties of being highly toxic to mosquitoes and at the same time non-injurious to man, higher animals and plants. Thus, pyrethrum is an essential and non-replaceable ingredient in the larvicide and mosquito control workers should encounter no extraordinary difficulties in either obtaining pyrethrum extract for preparing the larvicide or the finished concentrated larvicide.

Furthermore, as the writer has emphasized in previous publications, the pyrethrum larvicide cannot effectively replace petroleum oil on all kinds of mosquito breeding waters. Its application should be limited to such areas where mosquito oil is really objectionable from the standpoints of (1) injury to fish, water fowl and Aquatic plants; (2) destruction of ornamental vegetation and marring scenery in residential sections, ponds, swimming pools, etc.; (3) where fire hazards exist, and (4) in protecting outdoor gatherings. On all other types of

breeding areas, and especially where penetration and lasting properties of a quick-killing surface film are required, a suitable grade of fuel oil or "mosquito oil" should be used in preference to the larvicide, thus conserving our present supply of pyrethrum.

PUBLISHED ARTICLES OF INTEREST

From the Evening Star,
Washington, D. C.
Tuesday, June 23, 1942.

Allies in Africa Fight Gen. Malaria and Mosquito Army

One in Ten Who Visits Swamp Area Gets Dread Disease

By Edward Kennedy.

SOMEWHERE IN AFRICA, June 23 - Rommel is not the only enemy general in Africa, nor is his Nazis the only hostile army. Far more firmly entrenched on this continent, and as difficult to deal with, is "Gen. Malaria" with his countless millions of mosquitoes.

He doesn't operate on the main battlefield, since that is desert and "Gen. Malaria" prefers swamps. The western desert is full of flies which make life almost unbearable and spread dysentery, but fortunately has hardly any mosquitoes and consequently little malaria.

But one of the main connecting links between the Middle East arena and the United States is the airline which crosses Africa and runs through the worst malarial country in the world.

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But one of the main connecting links between the Middle East arena and the United States is the airline which crosses Africa and runs through the worst malarial country in the world.

Though it takes but a few days to traverse the

continent by this route, approximately one person in 10 who make the trip picks up malaria on the way. Of those persons stationed along the route on various jobs, practically all are stricken with malaria within two or three months.

Three Checks Tried

There are three means of checking the spread of malaria in any given area-to move all the infected people out of it; to destroy the malaria-carrying mosquitoes in it; to protect the non-infected persons from mosquitoes by screens, nets and other devices.

British and American Army doctors in Africa are pursuing all three methods.

In Eritrea, a native village in which almost every one has malaria, is being moved several miles away since there is an American construction job near the present site.

But there are swamps in which malaria-carrying mosquitoes breed in profusion and these are being attacked. Sometimes the breeding places can be eliminated or reduced by canalization, or by spreading paris green or kerosene over them.

Africa's swamps are so numerous and vast, however, that there is no hope of eliminating all these breeding grounds before the end of the war, or even in time for the next war. Only certain swamps near scenes of Allied activity are being tackled, and even these offer a job of staggering size.

Quinine Doses Given Daily

On some rush jobs in malarial areas, all Americans are given quinine daily. This does not prevent infection but it keeps men on their feet longer to do the job.

However, taking quinine in advance means it is less effective in treating the disease when it strikes in full force.

Four of the American military personnel have died of malaria in this area after crossing Africa. A war correspondent, Leslie Percy of the United Press, also died of it.

In most cases patients recover after a week or two of chills and fevers. Sometimes the malaria then recurs with clocklike regularity.

One British officer here gets it every Tuesday. He makes no social engagements for that day.

Another has a three-day spell four times a year. He knows just when it will come and has the period marked off on his calendar.

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SUBMARINE MOSQUITO BOTHERS THE WAR EFFORT IN FLORIDA

By Science Service
Palm Beach, Fla., June 12--

Because one pesky mosquito species has adopted U-boat tactics during its larval or "wiggler" stage of existence thousands of acres of water hyacinth that float on Florida rivers and lakes will have to be destroyed regardless of difficulty or expense.

The mosquito in question is a night-biting pest, that disturbs slumbers of aviation cadets, soldiers, sailors and war workers in scores of military centers in this state. Entomologists know her as Mansonia pertur-

bans; she has no common English name.

Edwin Seabrook, Entomologist and Technical Adviser on mosquito control for Palm Beach and Martin counties, has found that Mansonia larvae, unlike those of most other mosquitoes, do not come to the surface to breathe. Instead, they bore into the hollow, air-filled bulbs that serve as floats for the water hyacinth and get their air in that way. They also drill into the hollow stems of cattails and water lettuce.

This trick keeps them safely beneath the level of suffocating oil spread on the surface, which dooms top-breathing mosquito "wigglers". The only way to abate these pests is to destroy their semi-submerged air reservoirs in the stems of aquatic plants.

Use of the hollow floats of the water hyacinth by this mosquito species is interesting, for it represents an adaptation to a relatively new element in the environment. Water hyacinth is not a native plant; it was introduced from abroad many years ago because of its beautiful violet flowers, and has now spread until it clogs navigation on many Southern streams and lakes.

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By Dr. Thomas J. Headlee,
Entomologist,
Agricultural Experiment
Station,
New Brunswick, N. J.

In the American Journal of Hygiene, Vol. 34, No. 2, pp. 86-94, 1941, R. B. Watson and H. C. Maher record data on the effect of mosquito-proofing houses against Anopheles quadrimaculatus. In this study 98 houses were proofed and 45 were non-proofed. The findings indicate that mosquito-proofing gives considerable protection against malaria. It was concluded that while

the findings justify the extension of these studies and their continuance under more controlled conditions, the amount of data accumulated and the period of time covered being only one year, could not justify hard and fast conclusions.

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In the American Journal of Hygiene, Vol. 34, No. 2, pp. 102-113, 1941, G. E. Smith, R. B. Watson and R. L. Crowell record data bearing on the distances that Anopheles quadrimaculatus moves away from the point of breeding.

The first set of experiments consisted in the liberation of 3800 stained mosquitoes between June 15th and August 8th. All likely accessible resting places within 1 1/4 miles were inspected daily. The figures show that only 6 out of 3800 mosquitoes released were recovered and that they were recovered at distances of 2700, 1050, 675, 675, 600 and 375 feet from the point of release. These results were obtained in a territory where an abundance of blood supply was available within 1000 feet of the point of release.

The second set of records is concerned with a blood-film study of persons living in some 900 houses scattered more or less uniformly over an area within one mile of Lake Wilson. Positive results were obtained from 145 houses, 104 of which were within 3000 feet of the shore of the lake while only 2 were more than 5000 feet distant.

The third set of records was concerned with collections of females within 2 miles of a large natural pond where mosquito production was moderate and in a section in which all production in secondary breeding places was controlled. The figures show that the mosquito population fell off regularly as the distance from the

pond increased but that some individuals were collected more than a mile from it. Endemic infections among the population appeared to be associated, broadly at least, with the observed density of Anopheles quadrimaculatus.

The fourth study was concerned with malaria parasite indices in dwellings less than 3000 feet, between 3000 feet and one mile and more than one mile from the impounded river and showed 23% within the area of less than 3000 feet, 8% within the area between 3000 feet and one mile and 7% in the area of more than a mile.

The data from these various studies is considered to indicate that a mile is the limit of flight range of Anopheles quadrimaculatus under conditions of heavy infestation and that transmission of malaria is the greatest within 3000 feet of breeding places when sources of blood are available throughout the area.

In the Z. Angew. Ent., Vol. 28, pp. 501-506, 1941, J. Komerack and V. Breindl record survey work in Bohemia and Moravia in 1940. These workers state that Anophelines fed indiscriminately on man and any available domestic animals. They were abundant in village cowhouses and almost completely absent from adjoining bedrooms. This was due, not to a preference for the blood of the cattle, but to the microclimate resulting from the warmth and moisture produced by these animals in the dark, dirty, ill-ventilated and very warm cowhouses of the peasantry. The mosquitoes did not occur in the cowhouses on large estates, which are airy, light and clean, and have whitewashed walls.

In the Transactions R. Society Tropical Medicine and Hygiene, Vol. 35, No. 2, pp. 51-76, 1941, G. M. Findlay records yellow fever as occurring in Africa from the southern borders of the Sahara to the Belgian Congo, and from the West Coast to the Anglo-Egyptian Sudan and Uganda. The most striking African rural epidemic is one that recently occurred in the Sudan

but much smaller ones were observed on the Gold Coast. There is no evidence that Aedes aegypti was not a vector in all of them though other mosquitoes may have played an accessory part.

In the Chin. Medical Journal, Vol. 60, No. 1, pp. 66-72, 1941, J. H. Jordan and W. J. Silvey record laboratory and field studies of the comparative value of phenothiazine, paradichlorobenzene, tetralin, trichlorethylene and pyrethrum extracts as mosquito larvicides. These materials were used in a mixture of equal parts of kerosene and Diesel oil. Combination with water was obtained by emulsification with soap flakes. A mixture of para-dichlorobenzene and pyrethrum extract was most effective. Tetralin and pyrethrum extract were also good, sometimes exceeding para-dichlorobenzene. The results obtained with trichlorethylene and phenothiazine were disappointing. Tetralin was slightly toxic to mosquito-eating fish but had no ill effects on ducks kept in ponds. Para-dichlorobenzene appeared toxic to neither fish nor ducks, but the trichlorethylene emulsion rapidly killed the fish and had a toxic effect on ducks.

In the American Journal of Tropical Medicine, Vol. 21, #8. 6, pp. 767-777, 1941, P. F. Russell and T. Ramachandra Rao record a study of the effect of the surface tension of water on the behavior of Anopheline larvae and show that while it is possible to reduce surface tension to a point where the larvae drown, such conditions do not ordinarily occur in nature.

In the American Journal of Hygiene, Vol. 34, No. 2, pp. 95-101, 1941, C. C. Kiker and H. E. Breedlove record the cost of mosquito-proofing about 350 houses in the Tennessee Valley in 1938 and 1939 as averaging $33.00 per house.

Reference is made to an article on the use of nail kegs for Anopheles traps which appears in the May Issue of The American Journal of Tropical Medicine Vol. 22, No. 3, pp. 257.

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The proceedings of the 29th Annual Meeting of the New Jersey Mosquito Extermination Association, which meeting was held on March 11, 12 and 13, 1942, are now available for distribution. The report makes a book of 166 pages, with 27 illustrations.

The book is priced at $1.25, and may be secured by writing:

New Jersey Mosquito
Extermination Association,
New Brunswick, New Jersey.

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PERSONAL NOTES

Mr. Malcolm Pirnie, Jr., Area Engineer assigned to Malaria Control in War Areas in Virginia, was transferred on July 22 to a highway being built in Alaska, and his headquarters will be at Dawson.

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Mr. C. Edward Anderson, Field Engineer of the Morris Mosquito Extermination Commission has received an appointment to the U. S. Public Health Service. He has been assigned to the Philadelphia area.

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R. L. Armstrong: For a number of years associated with the direction of mosquito control work on Cape Cod, Mass., has been commissioned as First Lieutenant, Sanitary Corps, USA.

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D. W. A. Connell: For some time on the staff of the Bureau of Entomology and Plant Quarantine on mosquito research in Delaware and New Jersey, and more recently with the University of Delaware, was commissioned First Lieutenant, Sanitary Corps, USA.

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Emory C. Cushing: In charge of the Division of Insects Affecting Man and Animals, Bureau of Entomology and Plant Quarantine, Washington, D. C., has been commissioned as Major in the Sanitary Corps, USA.

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Donald Mac Creary: Conducted research work in Delaware, as a member of the staff of the University of Delaware. Has been commissioned as a Lieutenant, S.G., Hospital Corps Volunteer Service, US Navy.

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L. A. Stearns: State Entomologist of Delaware, and Director of research and control work on mosquitoes in that State; has been commissioned as a Major in the Sanitary Corps, USA.

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It may also be of interest to members of the Association to know that Stanley Freeborn, of the University of California, who has done some admirable work on the mosquitoes of the West Coast, has been commissioned Lieutenant-Colonel in the U. S. Public Health Service.

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It is probable that other men associated with mosquito control work in the Northeast have entered the service. In this connection it might be pointed out that the writer is attempting to keep a record of all those who are entering the service as entomologists and information regarding such appointments will be gratefully received.

Word has been received from Dr. David H. Brown, Director, Enrollment of Medical Technologists, American Red Cross, to the effect that Entomology has been included among the fields relating to medicine, in which the Red Cross is assisting the military by maintaining rosters. Entomologists and others experienced in mosquito control, who are likely to be drafted soon and who desire to receive assignments in entomological work or related fields, should submit their training and experience to Dr. Brown, who will review the information supplied and send the applicants a card which will assist them in being properly allocated when they are called to the service.

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